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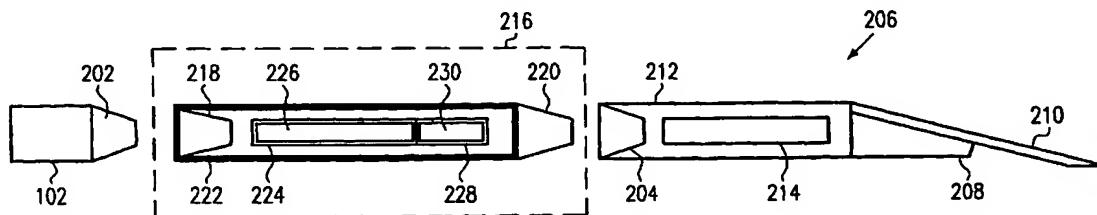
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(54) Title: PITCH SENSING IN DRILLING MACHINES



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(57) **Abstract:** A pitch sensor tool for a stem boring or drilling machine, for example a sub-surface directional drilling machine having a stem (102) and a drilling head (206). The pitch sensor tool comprises: a generally cylindrical housing (212) adapted to be mechanically coupled to said stem (102) and to said drilling head (206), and a pitch sensing device, the pitch sensing device being disposed in or on the housing (212) and being adapted to transmit a reading of the sensed pitch of the pitch sensor tool. In one example, the pitch sensing device is housed in a compartment (214) in the pitch sensor tool. Also disclosed are a boring or drilling tool incorporating the pitch sensing tool and a drilling head, and a stem boring or drilling machine incorporating the pitch sensing tool. Separation of the pitch sensing device from the rotating parts (i. e. drilling head or guide head) means that the pitch reading can be measured accurately and during a drilling procedure, as well as after it.

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